ENVIRONMENTAL ASSESSMENT BOARD

Ontario

ONTARIO HYDRO DEMAND/SUPPLY PLAN HEARINGS

VOLUME: 106

DATE: Thursday, January 23, 1992

BEFORE:

HON. MR. JUSTICE E. SAUNDERS	Chairman
DR. G. CONNELL	Member
MS. G. PATTERSON	Member

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ENVIRONMENTAL ASSESSMENT BOARD
ONTARIO HYDRO DEMAND/SUPPLY PLAN HEARING

IN THE MATTER OF the Environmental Assessment Act, R.S.O. 1980, c. 140, as amended, and Regulations thereunder;

AND IN THE MATTER OF an undertaking by Ontario Hydro consisting of a program in respect of activities associated with meeting future electricity requirements in Ontario.

Held on the 5th Floor, 2200 Yonge Street, Toronto, Ontario, on Thursday, the 23rd day of January, 1992, commencing at 10:00 a.m.

VOLUME 106

B E F O R E :

THE HON. MR. JUSTICE E. SAUNDERS	Chairman
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MS. G. PATTERSON	Member

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INDEX of PROCEEDINGS

L I S T o f E X H I B I T S

TIME NOTATIONS

---Upon commencing at 10:02 a.m.

THE REGISTRAR: This hearing is now in session. Please be seated.

THE CHAIRMAN: Mrs. Mackesy?

MRS. MACKESY: Thank you. Before I begin my cross-examination, I understand the witness panel wants to make some corrections.

MARK JAMES HUGGINS,
FRANCIS XAVIER MACEDO,
CHRISTOPHER ANDREW MILNE BANCROFT-WILSON
JANE BERNICE TENNYSON,
GIAN VASCOTTO; Resumed.

MR. HUGGINS: Yes, I believe there are three of us. One I would like to bring to your attention is that a few days ago, Mr. Shepherd in cross-examination asked about the reserve associated with the purchase in doing the economic evaluations of the purchase and I think I mentioned a number of about 10 per cent.

On review, it turns out that the reserve associated with the purchase is the same as the reserve associated with the major options against which it was evaluated and it is in the order of 25 per cent. In effect, the load meeting capability of the purchase is 80 per cent of the 1,000 megawatts in the evaluation.

DR. CONNELL: Can we get the page reference in due course, please?

MR. HUGGINS: I am sorry, not off the top of my head. I would have to look back, but I can get it for you at the break maybe.

MR. BANCROFT-WILSON: If I might go next. Referring to Volume 105, the transcript of yesterday's proceedings, under cross-examination by Mr. Rodger, page no. 18560, there was some discussion regarding the relationship of the DSP process and the site-specific process and the word "tandem" was used to discuss that process.

THE CHAIRMAN: I used it.

MR. BANCROFT-WILSON: You introduced the word tandem, Mr. Chairman. We talked about the site-specific process and your statement was about, I gather, that the site-specific process in tandem:

"Is in tandem, is that correct, with this process?"

And I said:

"Well, certainly the planning studies are underway in tandem."

I meant to say, are underway in parallel. So our planning studies are concurrent with this process and I wanted to separate that from the actual approval process. I am not sure exactly how the approval process will fit with this process.

But my statement was incorrect in saying that the planning studies are underway in tandem. It should be are underway concurrently.

THE CHAIRMAN: All right.

DR. CONNELL: So concurrent and parallel are synonymous, but tandem is not.

MR. BANCROFT-WILSON: But tandem is not. I think tandem means following end to end. [Laughter]

Do you understand that?

THE CHAIRMAN: Well, I think we have it. We could spend a little time on that. [Laughter]

I think I have to agree with you that parallel is better than tandem.

DR. VASCOTTO: If I may go next. There are some corrections to be made to Volume 97, page 17088 in reply to the Chairman's questions regarding the conversion factor for fields. That would be lines 11 through 14, and it says:

> There is a 10,000:1 conversion factor. In other words, 10 milligauss will equal one microtesla.

In the transcripts, it reads:

> "14 milligauss will equal one microtesla."

That is an error. It should be 10.

And following that:

Or 10,000 microtesla equal one gauss, not one milligauss.

In the same volume, page 17092, line 11, it reads:

"Of a microtesla, 2.4."

The correction should read:

Typically range from one tenth of a microtesla to 4 microtesla, rather than the number 2.4.

MRS. MACKESY: Mr. Chairman, I expect to take be longer than the morning break and possibly finish before that.

CROSS-EXAMINATION BY MRS. MACKESY (Cont'd):

Q. First of all, there are two verbal undertakings outstanding from yesterday and perhaps the panel could address those first.

DR. MACEDO: A. I undertook to provide you with the exhibit number for the 15 plans that we talked about or the work that we did in '85, '86 and yesterday we mentioned Exhibit 52 was one of them. There are three other exhibits, 50, 52 and 53.

Q. So there are three in total - 50, 52 and 53?

A. No. There are four in total - 50,

51, 52, 53.

Q. 51, I missed that. Thank you.

A. 52 covers the transmission aspects and the others cover other aspects of the 15 plans.

Q. Thank you. And I think Mr. Bancroft-Wilson, there was one matter you were going to check.

MR. BANCROFT-WILSON: A. Yes, Mrs. Mackesy, I was checking the cost of a steel pole 230 kV double circuit tower. I requested that information and they have not got back to me but I expect to receive that sometime this morning and I will provide it as soon as I obtain it.

Q. Okay.

MRS. FORMUSA: Just to wrap this up, the reference that Mr. Huggins made at the beginning with respect to reserve margin is found in Volume 103, line -- sorry, page 18231, line 21 and following.

THE CHAIRMAN: Thank you.

MRS. MACKESY: Q. Now, to begin with, I have three questions arising out of yesterday's cross-examination and they are all for you, Mr. Bancroft-Wilson.

The first one refers to the use of steel pole towers in urban areas and I think you said that

they are not always used, and my question is: Does Ontario Hydro have restrictions on their use similar to the way that it has restrictions on the use of narrow-based towers in agricultural situations?

MR. BANCROFT-WILSON: A. There were some guidelines developed a number of years ago which I have seen which are referred to for the use of steel poles. They are only guidelines and it is really left to a project-specific application again. It will depend on the amount of right-of-way available and the nature of the urban area you are going through and the type of line that is required.

Q. I see.

A. But it is really left -- it is a project-specific decision and costs, technical, environmental, social aspects are all taken into account in determining what type of structure to use.

Q. So in a way, that is similar to the situation with narrow-based towers in agricultural land because the final decision is left to Hydro?

A. Yes, it is. I am not sure the same technical limitations might apply as towards terms of foundation, but it is possible though those things could occur in the same way.

Q. Okay. Now, the next two are points

of clarification regarding the cost of narrow-base towers.

Yesterday we were speaking about a $30,000 to $40,000 difference above standard base cost. I just want to confirm that that is for a two circuit 500 kV tower.

A. Yes, that is correct.

Q. Thank you. And you mentioned that the figure you gave in direct evidence was a unit cost.

In case anyone should ask me, could you briefly describe what a unit cost is?

A. The numbers I gave refer to building 1 kilometre of a particular type of transmission line. That would include the conductors, the construction costs, the tower costs, so it would include everything involved in putting that in place on average for a kilometre of that line. So a unit was to construct a kilometre of that type of line.

Q. But when that was, shall I say, prorated to the individual tower, it was 20,000 to 25,000?

A. Yes. I just did an approximate calculation to give an indication of the relative difference in the tower costs themselves and that is all it was. It was taking the differences, primarily

the differences in the unit costs for a kilometre of narrow-based line versus a kilometre of a standard based line related to the towers, and that is where it came to the 20,000 to 30,000, but that, as I mentioned, did not include interest contingencies and overhead.

Q. You gave us 20,000 to 25,000.

A. Sorry, 20 to 25.

Q. I have only two questions left on narrow-base towers, and the first one is: Would you agree that farmers who want fair narrow-base towers installed face a lot of ifs and buts and in the end, the decision is up to Ontario Hydro?

[10:10 p.m.]

A. Yes, some farmers do want narrow-base towers installed. Other farmers have come to us and said, "I would rather have a standard base and give me the difference in cost to install it."

But in principle if the lines are located out in the fields then the majority of farmers would, based on my discussions and their concerns about the impacts, would prefer the smaller tower base associated with the narrow-base tower.

The guidelines Ontario Hydro uses and the criteria for putting those in again were discussed at the southwestern Ontario hearings and subsequently

Ontario Hydro's "decisions" about where to use those things were taken being back and reviewed with the Board in light of the evidence we had given at the hearings in terms of when they would be used, and the Board ruled in a couple of different cases on what they thought was a reasonable application of the guidelines.

So, yes, Ontario Hydro sets the guidelines but there is still the opportunity for a board to provide terms and conditions if they don't think those guidelines are fair or reasonable.

Q. But the individual farmer faced with this may differ in his opinion.

A. That's through the planning process, through the environmental assessment hearing, if there is one, the farmer has the opportunity to make that case, and obviously farmers did make that case before the Board as far as their views, and the Board made decisions as a result of hearing both sides, I think.

Q. But after the decision was made and you are actually installing the towers, deciding which towers to install in a particular situation, there still can be disagreement between Ontario Hydro and the farmers?

A. There may be a disagreement on the interpretation of the information.

Q. Would you agree that there was some controversy over the installation of towers, narrow-base towers on the Bruce to London and London to Nanticoke lines with some farmers feeling that they had been told they would get the narrow-base towers and then ending up with got the conventional wide-base towers?

A. Yes, that's correct. And that related to, based on an initial review of the location of the tower, the location that qualify for a narrow-base tower based on the guidelines as far as it being in a productive cultivated field. However, when the actual soil tests were done -- so, it was indicated to some people and we have learned from that, prematurely, perhaps, that that would be a narrow-base tower, subsequently doing the soil tests found that the unstable soils were present and it could not technically, economically be constructed, it was changed to a standard-base tower, and that did cause some concern in a few situations. I think out of 400 owners, I don't think there were too many cases of where that occurred, but there certainly were several.

Q. Thank you. I have finished with that topic.

Now, I want to look at Appendix C in

Exhibit 4. This is the environmental analysis, and it would be page C-7, in Appendix C, that is table C-3.

Now, this appendix is entitled summary of typical environmental effects and mitigation, and there were ten tables listing the environmental impacts of ten options such as nuclear, hydraulic and various forms of fossil options, including as well demand management and NUGs.

Each option, except demand management, has an entry for transmission incorporation, and in table C.3 on page C-7, about halfway down the page in the centre column there is the entry Transmission Corporation, and to the right under Potential Mitigation there is the one line entry, "Use existing right-of-way where possible."

The same single potential mitigation is listed for transmission incorporation in eight of the other tables, however, three extra measures were listed under the purchase option tables on C-17.

My first question is: Why is the use of existing rights-of-way selective as the typical mitigation measure for transmission incorporation?

A. Why is it being used here as an illustration?

Q. Yes, in this particular table.

A. Actually, I question whether it's a mitigation or it's a routing type decision.

The idea being is that we try to utilize our existing rights-of-way facilities wherever possible.

So, it is something that again over the years we have got a lot of pressure from people to look at those sorts of things, and we do give those things very close scrutiny in our planning studies. That's not to say, as I said the other day, that using the existing right-of-way or following the existing right-of-way is necessarily from an environmental perspective the best thing to do, but we certainly give it the full thorough analysis.

Q. And with regard to this particular table there would be other measures you would be using it for?

A. These are just illustrative of some of the things that could be done to minimizing effects.

Q. Would you please turn to the interrogatory package, at page 4. This is Interrogatory No. 7.29.21.

THE REGISTRAR: That becomes .130.

MRS. MACKESY: Thank you.

---EXHIBIT NO. 434.130: Interrogatory No. 7.29.21.

MRS. MACKESY: Q. The answer to the interrogatory is on the following page, page 5, of that package. In the interrogatory I asked Ontario Hydro to list what it saw as the benefits and drawbacks of following existing rights-of-way in locating routes for transmission.

I have only one question with reference to the answer, and that is at the top of page 5 in my package. It's the first benefit Ontario Hydro lists and it is entered as reduction in total width of new right-of-way required.

My question is: When two tower lines are built side by side, is the total width of the one right-of-way holding the two lines of towers less than what the combined width of two individual rights-of-way for those tower lines would have been?

MR. BANCROFT-WILSON: A. Yes, it is.

Q. Also, again turning to my interrogatory package, this time at page 20, and the Interrogatory No. is 2.29.47.

THE REGISTRAR: That is .131.

MRS. MACKESY: Thank you.

---EXHIBIT NO. 434.131: Interrogatory No. 2.29.47.

MRS. MACKESY: Q. My question there related to some information given in Exhibit 4, the

environmental analysis as page 5-44, table 5-6, under the heading, "Candidate Sites, Summary of Potential Considerations." My question was:

> With regard to nuclear sites, why is transmission incorporation listed as a consideration under the North Channel site but not under Wesleyville, Darlington or Bruce?

And I will read the answer into the record:

> Transmission incorporation should have been listed as a consideration for a nuclear station at both the North Channel site and the Bruce site as new rights-of-way would likely be required for radial transmission. The radial transmission required for the first new nuclear station at either Darlington or Wesleyville could be incorporated by new lines on existing Hydro-owned rights-of-way.

And my question is: Was the omission of Bruce, which is described as likely needing a new right-of-way, was that omission just an oversight or was there some other reason for not mentioning it in

this table?

DR. MACEDO: A. I would assume it's an oversight, nothing more than that.

Q. Would any of the other panel members have anything to add?

Now, my next questions have to do with electromagnetic fields. I am interested in the term prudent avoidance, and in this portion of my cross-examination I will be referring to Volume 97 at pages 17318 to 17320. I will be referring to Volume 26 later.

THE CHAIRMAN: I'm sorry?

MRS. MACKESY: Excuse me, Mr. Chairman. I mentioned to Ontario Hydro that I would be referring to a volume from an earlier panel, and we discussed that before I began cross-examination, but I didn't mention this particular volume to them, so it might throw them a little off base.

THE CHAIRMAN: All right.

MRS. MACKESY: I am beginning with Volume 97, page 17138 to 17320. Maybe I am wrong on the page reference. Just a moment.

[10:24 a.m.]

It's Volume 98. My mistake.

Q. Now, Dr. Vascotto, this is during

cross-examination by Mr. Castrilli and on page 17318 beginning at line 23 and going on to line 4 on page 17319 you said that in general your understanding of a prudent avoidance was that it meant:

> "...making common sense decisions which do not involve undue cost or undue hardship and which makes good sense in the long run in those situations where the outcome is not well-known; in other words, the potential impact is not particularly well-known but where it is expected to be large if it is to occur."

I think you went on to say farther down, page 17319, at lines 16 to 20 that: Ontario Hydro's routing practices very often tend to avoid population areas and that could fall under the idea of prudent avoidance. Is that correct?

DR. VASCOTTO: A. Yes.

Q. Thank you.

A. That's what the transcripts do say.

Q. Now, on page 17320 at lines 4 to 5 Mr. Castrilli referred to wider rights-of-way as being suggested as: a potential mitigation measure associated with electromagnetic fields.

As farther background I would like the

Panel to refer to Volume 26. This is my Panel 2 cross-examination of Ms. Ryan of Ontario Hydro's Environmental Division about the effects of keeping lines out of built-up areas more than is done now, and this is in Volume 26 at page 4693.

And it begins at line 10, my question:

> "Do you recognize that would increase the burden of these lines on people in the country, and perhaps on farms to an even greater extent than is happening now, in the sense that they might become even more likely targets for location of rights-of-way?"

And the reply at line 15 was, "Yes."

My question to the Panel is, after that long introduction: Would you agree with Ms. Ryan's response to the question that I asked in Panel 2?

MR. BANCROFT-WILSON: A. Can I just have a moment?

Yes and no. As we have indicated before in our evidence identification of built-up areas, communities, homes, residences are one of the criteria that we identify in our studies.

Obviously, displacement or disruption of those communities or those people -- avoidance of that

type of disruption is a high priority in our studies. However, we do build lines through communities or maybe parts of communities or built-up areas where it is perfectly compatible to build a line, and there are transmission lines through urban areas. And it really depends on the type of disturbance or disruption you are going to have to the community and to the individuals. In recent studies of farm communities we have built lines, rebuilt lines through communities.

We don't go out of our way to put lines away from people. What we look at is trying to minimize the disturbance and disruption, and you can do that. You can build lines through built-up areas and still minimize the disruption on the community and on the people in many cases.

So it is preferable from a sense of displacement/disruption and to the community to try to avoid that, but not necessarily just to blanketly avoid built-up areas. So I would agree with her in part but not entirely and in the way that's said that we would avoid built-up areas.

Q. Let me just get this straight. Are you saying, then, from your point of view applying the idea of prudent avoidance would not change your present routing practices?

A. I am talking about our current routing practices and that the concept of prudent avoidance is not part of our routing practice now. I am saying what our routing practices are now, and the reasons that we may or may not avoid built-up areas depends on the circumstances in that community and how we may affect it.

Q. Are you thinking of applying the idea of prudent avoidance with regard to electromagnetic fields in future routing of transmission lines?

A. Not to my knowledge in terms of routing studies I am involved in, but if Dr. Vascotto wants to add anything to that...?

DR. VASCOTTO: A. As of the time this panel met, that was not a consideration. If scientific evidence should dictate that that procedure be taken, then it would be considered, I would expect.

Q. At that time one of the potential mitigation considerations would be wider rights-of-way and avoidance, more avoidance of built-up areas?

A. If a prudent avoidance strategy were to be adopted all measures that could be used to reduce fields would have to be considered and the most prudent one be adopted. And I suspect that there are many, many options.

As I mentioned in cross yesterday, widening the rights-of-way imposes some impacts, some known impacts which may not make sense, may not be desirable to impose for a potential impact. So all of those things would have to come into consideration because there are many factors that have to be considered in making such decisions.

Q. But the two suggestions or two measures I have mentioned would be part of those considerations definitely?

A. They would be considered, but there would be many others.

Q. I see. Thank you. Are there any technology developments in transmission line design and operation that would remove the electric and magnetic fields associated with transmission lines?

DR. MACEDO: A. I am not aware of any.

Q. The idea of social acceptance has been discussed at this hearing. Would that also be a consideration in considering measures to take if prudent avoidance were to be applied to the routing of transmission lines - social acceptance in the sense that people would be more concerned than they are now or they have been in the past about living as close to a transmission line as the current engineering

practices allow?

DR. TENNYSON: A. I don't really think that is in the sense that it has been sort of talked about at this hearing.

Ultimately, it is sort of the government and hearings such as this that would determine the sort of social acceptability of any of our proposals, so any concerns that are expressed we have to try and address through our studies and through our environmental assessments, and then ultimately it's up to -- and they could include, as I say, any measures; right?

Q. Yes.

[10:34 a.m.]

A. So ultimately, it would be a hearing board that would, I think, decide how "the social acceptance" might be determined or the government in terms of our planning.

Q. But it could be an important factor in such a situation?

A. I assume so.

Q. Okay. Now, Mr. Bancroft-Wilson, would you agree that the natural environment can suffer damage from the presence of transmission lines even though the people directly affected by the line are content to accept the situation? I suppose I would use

as an example of that something you mentioned earlier this morning where a farmer might prefer a little money in place of a narrow-base tower.

MR. BANCROFT-WILSON: A. Certainly there could be impacts on the natural environment. As a matter of fact, a big part of doing our studies, is when you affect people, they and their properties, their communities, you hear their concerns voiced.

But a big part of it is also looking at the more natural areas where there aren't as many people and looking on the effects on those areas and the importance and the significance of those.

So, yes, there can be effects and we try to balance off the effects on both.

Q. And those impacts would remain as long as the tower line stands?

A. Well, again, it depends on the type of impact. If you are looking at a loss of a certain type of habitat on the right-of-way from a natural point of view, yes, that would be permanent.

Disturbance to wildlife in the area may be more short term during initial right-of-way clearing and construction, just as some impacts on agricultural are short term and others are long term.

Q. Okay. And would you agree that while

issues may come and go as matters of public concern, the impact and the residual damage remain?

A. Yes. As I said the other day, there are effects no matter how carefully we route and locate, construct our facilities. There are changes and effects and the extent that their impacts will depend on what is there, what the people feel about that, but there will be residual impacts and effects when all is said and done.

Q. There will be impacts and effects regardless of how the people feel about it?

A. Yes, there will. Again, the extent and significance of those effects and how important they are to the community, many of those will depend on how the people feel about it, but there will be effects regardless of how the people feel.

Q. And my next question is asked to both Dr. Tennyson and Mr. Bancroft-Wilson. In its attempt to provide mitigation by eliminating impacts in some areas, does Ontario Hydro create a situation where many people escape the negative impacts but a smaller number of people are forced to accept them in their environment?

A. Could you repeat that one again, Mrs. Mackesy?

Q. In its attempt to provide mitigation by eliminating impacts, I gather that is one way you mitigate, to just move a line from one area so that that area doesn't have the impacts. When you move the line, then it affects somebody else.

DR. TENNYSON: A. If I could speak to that?

Q. Yes.

A. It is not so much moving a line. What we have when we do our planning studies or project-specific ones are a number of routing alternatives. And so, in the evaluation of those, one valuation thing would be to try - not one of them, all of them - would attempt to find an option that minimizes the impacts, okay. I mean, as a principle, all right?

Q. Yes.

A. Now, what then in terms of that, say, recommended alternative does, certainly it has effects or impacts on the area.

But for argument sake, it could be a remote area that is already industrialized and so, the impacts are perceived to be not that significant, let's say, as an argument.

In other instances, clearly there are

going to be individuals affected.

Q. Okay. Now, this comes back to a point you spoke to earlier, Dr. Tennyson, about social acceptance. And the witnesses have spoken to the importance of social acceptance both of a Demand/Supply Plan and of specific projects.

Is there social resistance to the building of bulk transmission lines in urban areas?

A. In certain instances, certainly I am aware of it, yes. I don't know though. I think in response to one of the interrogatories in terms of any sort of surveys done in general, what people in different areas think of transmission lines, I don't think we have ever done any specific research, but I do know that in particular parts of the province, there has definitely been resistance, yes.

Q. Okay. Is it particularly strong in urban areas?

A. Based on my experience, I don't think it is any different than it is in rural agricultural areas, but somebody else could correct me if I am wrong.

Q. Does anybody else want to say anything?

MR. BANCROFT-WILSON: A. Yes, it can be

very strong. There could be not a lot of concern just as it can be in the rural area. You know, it can be a range and I think the range is present in both environments.

Q. Now, would you please turn to page 15 of my interrogatory package, and this is Interrogatory 7.29.31.

THE REGISTRAR: That is .132.

MRS. MACKESY: Thank you.

---EXHIBIT NO. 434.132: Interrogatory No. 7.29.31.

MRS. MACKESY: Q. I will read my question into the record and then the response: The question:

> "Regarding effects of not building generation where the demand for electricity is, do transmission lines such as though out of the Bruce Nuclear Power Development which allow generating stations to be built distant from the areas of need, cater to the NIMBYism - that is, Not-In-My-Backyardism - of those who demand power by allowing them to have the power while escaping some of the impacts?"

And the answer was:

"No, NIMBYism is not a criteria for routing transmission lines or siting generation."

And my question is: What is the difference between social rejection and NIMBYism? I am using social rejection as the opposite of social acceptance.

DR. TENNYSON: A. I honestly don't know. If you mean by social rejection that the public at large, you know, the Ontario community has a certain feeling about something, then I think that is different than -- I don't like the term "NIMBYism" anyway, but it is a not-in-my-backyard syndrome. I see that more as an individual response rather than a more collective response, but I mean --

Q. That is your personal opinion and someone else might differ?

A. Yes, exactly.

Q. Okay. Some other people do differ.

Now I would like to go on to the public consultation process and some of the attractive aspects of that process have been spoken to and I would like to ask some questions with regard to some of the less attractive aspects. I don't know whether these ideas will be new to you.

Am I right in thinking that the public consultation programs include both the local community leaders such as elected municipal representatives or the leaders of different community groups, so both the local leaders and interested individuals?

A. Yes.

Q. Have any of the local community leaders ever expressed discomfort over being put in the position of saying it is better for a route to go over here rather than over there?

A. Based on my experience, yes. But also as part of these processes, you know, the opportunity given is to have input, to review, to whatever. And often there's lots of input given from community leaders in that respect.

Certainly I am involved in a project right now where the community leaders are very much wanting to indicate their preference for where the route might go, so it varies.

Q. I am thinking of a situation where the individuals in the community effected by that response from the leaders might feel that they were being made scapegoats on behalf of a particular segment of the community.

A. I think you are getting into an area

of how representative leadership can be. And once again, I mean, that is a political question. It varies, I am sure, across the province.

But I want to point out that in terms of our processes and the design of them, certainly it is not just with community leaders; it is with the community at large.

We have many, many opportunities for individuals to get involved, to come and express their viewpoints because, as I have said, we want to hear from everyone that is potentially effected.

Q. Okay. Going on to the individuals who might come to take part in the process or not come, have any individuals ever expressed resentment over being put in the position of having to either suggest a line in their own immediate proximity or dump it on a neighbor three or four miles away when they feel that the line shouldn't be in the study area at all but somewhere 100 or 150 miles away?

MR. BANCROFT-WILSON: A. Yes, people have but we don't ask them to do that. We don't ask individuals. If we say, okay, do you think there might be a better alternative, quite often you will have around the table several people who will live in that area and own properties and they will say, well, yes,

if we moved it over here, this might be better. Many people are reluctant to say move it off my property onto somebody else's, but quite often there's compromises available and that happens.

What I have stressed in my evidence was, you know, we care about people's views and reasons for feeling the way they do and that helps us construct a rationale. Just telling us they don't want the line there, we want to know why and where they think it might be a better location, not necessarily to identify that but the types of areas we think we should be locating in. So, you try to eliminate that. We are not try trying to pit one person against another. In public consultation that is not what it is about.

In terms of the representation of municipal officials, yes, we get them involved at times to try it again. They represent their community, so from a certain perspective, they are very valuable. But as Dr. Tennyson said, sometimes it is debatable -- they don't speak for the entire community.

Some leaders will come forward and say, based on working through the studies -- now, this isn't something that is done at the start of the study; it is after a year, a year and a half, two years' work, all the information considered, you know, what do they

think is the best alternative if it were to go through their community and some will identify that; others are reluctant.

Q. Is there a situation for an individual perhaps where they feel they are caught between two very difficult places, in that if they don't take part, they can't protect their own interests, but they don't want to take part to damage somebody else's interests in their own area?

A. By taking part in our process, I think anybody who has worked through it will not get the feeling that they have damaged anybody else's interests.

We encourage people to get involved and we tell them that by participating, it doesn't mean they support it or agree with what we are doing, but their participation will help us and it will ultimately help them be better prepared if they want to oppose a facility.

[10:50 a.m.]

But I don't think that you can characterize it that by getting involved they are going to be damaging somebody else's interest.

Q. I accept that you see it that way, but would you agree that an individual might see it

differently from what...

A. I can appreciate certainly somebody would take that view. I am saying that's not a view that I had very widely expressed, and I have worked on hundreds of groups with thousands of people and that's not something that's come forward as being a concern.

It's more a concern that somehow if we work with you are we somehow agreeing to what you are going to do, and we make that very clear up front, that working with us and participating in the studies in no way is an agreement or endorsement.

Q. Okay. I have two more questions on this area. The first one may sound harsh, but it's not frivolous. Has anyone ever said to you that what these groups are is Ontario Hydro getting the local people to do Ontario Hydro's dirty work for it?

DR. TENNYSON: A. To the best of my recollection, no one has said that to me.

MR. BANCROFT-WILSON: A. I can't put name and a face, but again, I saw thousands of people and a lot of things have been said to me-- [Laughter]

Q. I can appreciate that.

A. --which we wouldn't want to discuss here. But yes, I think that view has been expressed perhaps on more than one occasion, but I would say it's

not a predominant view that I have heard over the last 15 years.

Q. My final question on this manner may have been answered in something you have already said before in this section, but I will place the question again anyway just to be certain of it.

My final question is: Do you ever get the feeling that the selecting of a transmission route promotes a bad feeling among neighbours?

A. I think there is that possibility. Again, you have to look at our perspective and where we are coming from dealing with a community. We often spend a year, a year-and-a-half with people, get to know them very well, and they tell us a lot of things that are going on.

It's not something that I think is a predominant feeling I am left with after those type of studies. As a matter of fact, one of our things is that actually there is nothing like having a transmission in your community to bring the community together. I think we have spawned more to fundraisers, bake sales, raffles. When we have an information centre people come and hassle us or talk to you us for a couple of hours and they stay around and chat.

So there may be some of that certainly

between neighbours, but I think it is pretty isolated. I would suggest that perhaps where it does occur, there perhaps may be was some friction between those two neighbours over something anyway. As you well know, over fences and things like that, they is various disputes that go on in any community between neighbours and not just the farm community.

Q. So this could exacerbate what was already there.

A. It could. And it also gets people together that haven't seen each other for many years.

Q. Okay. I have a few questions follow up out of that.

Would you nevertheless agree that there are situations where it could promote bitterness in that one person is affected by a line, that they really don't want to complain that they are unhappy, but it's there and it came about --

THE CHAIRMAN: I think this line of questioning has been pretty well exhausted. I think Mr. Bancroft-Wilson and Dr. Tennyson have given you the answers that you need in this line. I would move on to something else.

MRS. MACKESY: I have only one another question, Mr. Chairman.

Q. Has Ontario Hydro heard dissatisfaction expressed among people who have granted Ontario Hydro easements for transmission lines about the small amount of mitigation and compensation they received for the right-of-way compared to the value to society as a whole that society gets from low cost electricity? And before you answer I should add that I am particularly thinking of situations where the lines were put in 20 or more years ago.

MR. BANCROFT-WILSON: A. Yes, I have talked to people who feel that the amount that they received for the easements 20, 25 years ago was fairly small relative to the inconvenience they continue to have to put up with today.

MRS. MACKESY: Mr. Chairman, with your indulgence, may I place one more question with regard to the area I asked about regarding public perception?

THE CHAIRMAN: All right.

MRS. MACKESY: Thank you.

Q. Mr. Bancroft-Wilson, you mentioned people getting together with bake sales and coming to talk to you at the information centres. Would I be right in saying that this isn't always done because they agree with what Ontario Hydro is doing, it could be done, because they are not in opposition to it and

because they want to find out more of what...

MR. BANCROFT-WILSON: A. No, no. Let me qualify that.

It's as a result of us coming through. And it's quite often the community banding together to oppose or to gather and collect the community's views. It's more in the sense of opposing or being concerned about what is happening.

I didn't mean to give the impression the bake sales were to raise money for us. [Laughter]

MRS. MACKESY: Thank you, Mr. Chairman, those are my questions.

THE CHAIRMAN: Thank you, Mrs. Mackesy.

Mr. Rogers?

MR. ROGERS: Yes, sir, thank you.

Good morning, Mr. Chairman, Members of the Board. You will be pleased to learn that I will be very brief again.

CROSS-EXAMINATION BY MR. ROGERS:

Q. Ladies and gentlemen, I would to address a few questions about transmission limitations, and from a review of the transcript I think that Dr. Macedo is probably the one to answer these questions.

As I understand your testimony, Dr. Macedo, if the Manitoba Purchase goes ahead and is

approved and comes about, additional transmission is going to be required.

DR. MACEDO: A. That's correct.

Q. And as I understand it, that additional transmission will be or is contemplated to be added by sometime around the year 2000 or so?

A. Yes, by 1999.

Q. Fine. So you are here before this Board asking for, in effect, approval of that general scheme, including transmission additions to be implemented by the year 1999?

A. That's correct.

Q. In previous testimony, specifically the panel dealing with non-utility generation, we were told that there are certain transmission limitations on your system which restrict the addition of non-utility generation potential.

A. That's correct.

Q. And, in fact, I think you referred to that as well in your testimony in chief; correct?

A. Yes, I did.

Q. Have you identified how much non-utility generation - and by that I mean economic, otherwise economic non-utility generation - will be excluded because of transmission limitations?

A. I haven't but I am sure the NUG division would be in a better position to tell you that. I don't have any information on that.

Q. All right. I suspect they told me that same thing, but perhaps not.

In other words, I think they referred me to you.

A. I can only tell you, I will tell them and you what the transmission limitations are--

Q. You have done that.

A. --to non-utility generation. And beyond that it is up to the NUG division, the NUG people to determine to what extent those constraints impact on the development of non-utility generation. I don't have that information.

Q. Do you know of any study that's been done specifically by Ontario Hydro or analysis, specific analysis that has been done by Ontario Hydro to merge those two concerns; that is to say the amount of non-utility generation which is being excluded or potentially excluded because of transmission limitations?

A. Well, I am not aware of any study in that direction. But I think what is going to happen in the 1991 NUG plan is that they, the NUG division, are

going to provide data on NUGs, on the NUG forecast without any transmission limitations, which is good information for us because then we can take that data and see where we might improve the transmission system in order to provide the flexibility to incorporate those NUGs if they are economic.

Q. Good. Because that's what I wanted to talk to you about just for a moment. You are aware of the update, of course, that's been filed with this Board.

A. I am aware of it. I haven't fully gone through it.

Q. I am glad to hear you are aware of it. I think you would be the only person in Ontario who wasn't if you hadn't. [Laughter]

In any event, we have been told that there is a certain amount of uncertainty about the forecasts which are incorporated in that update, more than usual uncertainty I think it is fair to say.

Are you aware of that?

A. With regard to NUGs you say?

Q. Well, with regard to NUGs, with regard to fuel switching, with regard to conservation effects, and so on.

A. Yes, okay.

Q. And as we understand it, and in fact it's in your Exhibit 452, Ontario Hydro was relying upon short lead time options such as oil, gas burning combustion turbine units, and additional non-utility generation as an interim measure should your forecast of these other sources of supply not prove out in practice. Do you understand that?

A. Yes, I do.

Q. So there appears to be a greater reliance on those shorter lead time technologies, such as gas turbines and non-utility generation, than existed before the update, agreed?

A. Yes, I agree with that.

Q. How long does it take to build transmission generally, augment transmission?

A. If we don't need any approvals, in other words, we can proceed with the work, it's typically -- the shortest lead time I would say is three years, but that's not -- we are talking here about fairly minor pieces of work, so three to five years I would say for this sort of work.

Q. And with approvals is it longer?

A. Definitely.

Q. So we are talking, what, about five or six years minimum from the time you first decide you

need a transmission addition until you can have the approvals in place and have it constructed?

A. It can vary between five to ten years.

Q. Thank you.

My concern is this: If non-utility generation, taking it for the moment, is now being relied upon more heavily as the backup against these increased uncertainties that Ontario Hydro tells us about, what is Ontario Hydro doing now to make sure that the transmission limitations are overcome if and when we need those additional non-utility generation megawatts?

A. Two things, and in my direct evidence I indicated that it is important from a transmission planning point of view that we have short lead time options available so that we can incorporate the short lead time supply options.

We are doing two things: One is that we intend to proceed with reinforcements to the system that we can do without approvals, and I have in previous testimony discussed those.

Q. Yes?

A. I won't go through them. But essentially to reinforce those main interfaces.

Q. May I just interrupt you there, Dr. Macedo. Those plans were in place before the update was completed, though.

A. Those plans were in place but we haven't made a decision to proceed with that work. We have a lot of plans on the system. I am talking here about proceeding with the work and committing those facilities.

Q. I'm sorry, I interrupted you. You continue and then we will come back to it.

A. Okay.

The second thing is proceed with the route and site studies for major new rights-of-way. I indicated that there were four such rights-of-way, one, of course, is to do with the Manitoba Purchase.

Q. Yes, I read that.

A. The second one is north of Sudbury, to Pinard.

Q. May I interrupt you? I'm sorry. I wasn't inviting you to repeat your evidence in chief, I have read that and I am sure the Board recalls it.

[11:03 a.m.]

My question really was addressed to the change which has occurred since you drafted this plan and I think even after you started to give your

testimony. That is the update.

What is Ontario Hydro doing now differently than you were planning to do before the update to ensure that the transmission is in place to allow for the rapid addition of NUGs as the back-up if it's needed?

A. We will make sure that we continue with the definition phase work, but in the short-term, as I said, we are proceeding with reinforcing those interfaces.

Q. But this was your plan before, wasn't it, Dr. Macedo?

A. As I just said, there are plans on the system, but there is a difference between having plans on the system and proceeding with the work.

Q. All right. All I am really trying to find out here, and perhaps you have answered and I have not understood. What change has taken place with respect to the timing of these transmission additions since your update was completed?

A. Well, it has to do with timing. If you look at the CCR reinforcement we weren't planning to reinforce CCR in 1996.

Q. What's CCR?

A. Sorry, one of the main interfaces.

This is interface, Cherrywood/Claireville/Richview interface. We are proceeding to do that work as soon as we can and the earliest and maybe optimistic date is 1996. That's one thing.

Q. When were you planning to do it before the update?

A. Well, before the update it wasn't required until beyond the year 2000.

Q. So over the past few weeks you have decided to move that up to 1996?

A. I wouldn't say over the past -- depends what you mean by the past few weeks. The past few months, yes.

Q. Past few months. What other plans have you changed to expedite transmission additions to facilitate non-utility generation?

A. Not necessarily non-utility generation, but new supply.

Q. All right. New supply.

A. We have again the reinforcement of the FIGTA interface, which is the interface which is the flow into the Greater Toronto Area interface.

Q. Has that been accelerated because of your update?

A. You are concentrating on the update.

Over the last few months since we realized that transmission constraints on the system with regard to non-utility generation limits where non-utility generation might be located and therefore could be constraining the development of economic non-utility generation.

We have determined that we need to advance certain reinforcements.

And I talked about the CCR fix-ups. With regard to FIGTA, we have determined that we should proceed with the second line. Originally, the plan was 1999. Now we are saying we should advance that, and the earliest date -- it's only a one-year advancement. I think we can't get it much sooner than 1998, but we are proceeding with that work to get it in as soon as possible.

So those are two things.

Now, we have -- in previous testimony I have indicated that we have lots of plans on the system, and what we have to do as we do every time a new load forecast comes out, every time the situation changes with regard to forecasts for non-utility generation and so on is that we go through all these plans and see what do we do. How does the new forecast affect the timing of those plans, and how does the new

forecast affect the sequencing of those plans?

This is something that we will be doing, and I have indicated that either in the next month, two months we go through the business planning process, and as part of that process we will be reviewing all these plans in a lot of detail and coming up with a new timing and sequencing of these plans.

Q. This will be after the analysis of your non-utility generation people as to what potential exists, and where it exists, and what transmission limitations might constrain its addition?

A. That's part of it, but that's not the only thing.

Q. No, I understand.

A. You know, load forecast affects it, too.

Q. I understand. What's different, you see, Dr. Macedo, from a month or two ago so far as we outsiders are concerned is the greater reliance that Ontario Hydro is now placing on non-utility generation as the back-up source of supply should your forecast prove to be in error. You understand that, sir?

A. Yes, I do.

Q. So you would agree, I think, that it is a reasonable question for we outsiders to ask, well,

what are you doing, Ontario Hydro, to make sure that the transmission limitations that you have told us about are alleviated so that you can indeed add those defined short-term solutions? You understand that?

A. Yes, I understand that.

Q. Because if the transmission isn't available it is not a short-term solution, is it?

A. That's exactly what I would say.

Q. And hence, we can't rely upon it in the event that your forecasts are in error?

A. That's absolutely right, and this is why -- we recognize that--

Q. Good.

A. --and we are going to make sure that we have -- we can do what we can do in the time available, and we are proceeding with that work.

Q. Very good. And when can I tell anybody who asks me when Ontario Hydro's proposal for these transmission additions will be available? When will we know what you propose to do about --

THE CHAIRMAN: I think he has already said in rough terms what he proposes to do.

If I can interject, a couple of things. First of all, 452 just didn't arrive overnight. It has been a process that has been going on since the

Demand/Supply Plan was initiated, and this is in effect a consolidation of a number of things that have been developing and which everybody has been more or less aware of.

I don't know whether it was parallel, tandem or whatever, but all these things go on at the same time and they are inter-related.

I would think that this is an issue that could very well be revisited, Mr. Rogers, when we get to Panel 10, which is going to then pull together the planning and a very pertinent question at that time, I would think: Do you have adequate transmission to meet the various contingencies that the present planning process seems to envisage?

So I don't think you can really carry it very much farther today than Dr. Macedo has done.

DR. CONNELL: Just to add an observation about testimony we had yesterday, and perhaps Dr. Macedo can tell me if I have got it correct, but with respect to inter-area transmission, and the key reference there is Exhibit 433, page 8, Dr. Macedo testified that there will be in place, by 1996, inter-area transmission which would accommodate 2,900 megawatts, and I believe you went on to say that there would clearly be capacity in or around the Greater

Toronto Area for--

DR. MACEDO: More.

DR. CONNELL: --more than that.

DR. MACEDO: That's correct.

DR. CONNELL: So you saw no problem in reaching the target cited in the 1990 NUG plan, provided it was appropriately distributed?

DR. MACEDO: That's the key thing. That's right. Provided that it is distributed as given on page 8 of Exhibit 433, there is no problem in incorporating 3,100 megawatts.

DR. CONNELL: And referring to Exhibit 452, page 22, it cites the possibility of deferring up to 1,200 megawatts of purchase non-utility generation commencing in the mid-1990s.

So, subject to whatever changes emerge in the 1991 NUG plan I assume that at the very least in the kind of contingent that Mr. Rogers is exploring that at least that 1,200 could be restored if load growth is much higher than anticipated; is that correct?

DR. MACEDO: That's correct.

MR. ROGERS: Thank you, sir. That's helpful.

All right. I think those are my

questions. Thank you very much, ladies and gentlemen. Thank you, Mr. Chairman.

THE CHAIRMAN: Thank you, Mr. Rogers.

Mr. Campbell?

MR. M. CAMPBELL: I expect to be about an hour, Mr. Chairman. Perhaps a little less.

THE CHAIRMAN: We will take a break sometime within that hour. If you would rather continue, we could take a break now and you can go.

MR. M. CAMPBELL: Am I the last party up here?

THE CHAIRMAN: I think you are. I was going to say "hope you are", but I am not going to say that. [Laughter]

MR. M. CAMPBELL: It might be easier to take the break now. I expect to be able to finish before lunch.

THE CHAIRMAN: Why don't we take the break now, then.

THE REGISTRAR: The hearing will recess for 15 minutes.

---Recess at 11:13 a.m.

---On resuming at 11:32 a.m.

THE REGISTRAR: The hearing is again in session. Please be seated.

MRS. FORMUSA: If I might, Mr. Chairman, I thought I would address a point that Dr. Macedo made to Mr. Rogers with respect to approvals. And it has cropped up a number of times during cross-examination that there were some activities we would be doing without approvals.

I am fairly certain the Board is aware of this. Some of our activities are under umbrella approvals under the class environmental assessment for minor transmission and it is those approvals that would capture some of the minor activities or refurbishments and I just wanted today make that clear. I was pretty sure you were aware, but --

THE CHAIRMAN: Oh, I think Dr. Macedo made that pretty clear.

MRS. FORMUSA: Okay.

MR. M. CAMPBELL: I thought I might give you a brief outline of the questions I intend to ask, Mr. Chairman. I would like, first of all, to put one or two questions on health effects beyond Ontario. I understand that Ontario Hydro takes the position that that is really beyond the scope of this hearing, but I expect to spend perhaps only a moment or so on it just for clarification of one of my concerns.

I then intend to focus on Exhibit 432. I

will put one of two questions in the areas of occupational health and safety, herbicides and PCBs, but I intend to try and focus on the magnetic fields which are referred to in Exhibit 432 in some detail.

CROSS-EXAMINATION BY MR. M CAMPBELL:

Q. Now, the first question then has to do with the responsibility which Ontario Hydro takes or does not take respecting the health effects in Manitoba or other jurisdictions connected with generating and transmitting electricity in Manitoba for use in Ontario.

What is the approach or the view of Ontario with respect to the health effects in Manitoba?

MR. BANCROFT-WILSON: A. I guess it is Ontario Hydro's position that the effects of the facilities required to incorporate the purchase in Ontario will be examined under our hearing process and under our project-specific environmental assessment, and that the effects and impacts of the facilities in Manitoba will be dealt with under their own jurisdictions, both federal and provincial.

Q. Do you have any estimate of the health costs in Manitoba which may arise in connection with Ontario Hydro's purchase of electricity in Manitoba?

A. No, we don't.

Q. Okay. I would like to turn to Exhibit 432 if I may. Now, this is a document entitled, Materials Relating to Environmental and Health Effects of Transmission Facilities.

I would like to start with the health assessments studies which are referred to on page 14 relating to the use of herbicides. This is a question to any member of the panel: The first paragraph under the heading "health assessment studies" on page 14 refers to a possible link between the use of herbicides and the incidence of certain cancers in humans.

Is this a suggestion that there was a causal link or is this a suggestion that there is an association between the use of herbicides and the incidence of cancers?

A. I am afraid I don't have any information on that. I was not involved in the writing and drafting of this report.

Q. Do you understand that there is a distinction between those two types of approaches, a causal link as opposed to an association? Is that a valuable distinction in assessing linkage?

DR. VASCOTTO: A. Yes, it is. In one case, the cause has actually been established, or

rather, a cause effect has been established and the response has been established.

Q. Also in relation to herbicides, do you have any costs, cost estimates, showing the difference between the use of herbicides in your transmission corridors as opposed to the health cost associated with hand cutting or other forms of manual cutting, clearing? Do you have any estimate of health costs?

MR. BANCROFT-WILSON: A. No, not to my knowledge, we don't have that information.

Q. On page 15 there is a reference to an Ontario Hydro occupational health study and it refers to the study of workers who may have been exposed to herbicides, and the second paragraph of that section states:

> Overall, no increased mortality was observed among this group relative to the reference population. Specifically, no deaths were observed due to those cancers which other authors have shown to be associated with exposures to similar types of herbicides.

Then it is qualified:

> However, the demographic character of

the cohort was such that the majority had not reached an age when mortality would be expected and, therefore, there is a recommendation that the cohort continue to be followed.

Has Ontario Hydro gone back in its records and looked at the possible exposure which workers have received in the last 10 or 20 years and attempted to study workers who may have been exposed in the past?

I see heads shaking. I take it that is no?

DR. VASCOTTO: A. At this point, I personally don't know if that is the case.

Q. So if this paragraph is correct, we would be looking at studies which would extend over the next 10, 20 years; is that correct?

A. If that were the case. There is an epidemiologist on staff at Ontario Hydro - but that individual is not here at the moment - who would be able to answer that question. We really have no knowledge of the study.

Q. So I take it there would be no attempt or has been no attempt or you have no knowledge of any attempt to review employment records of workers

who may have been exposed to this in the past.

A. That would be correct.

Q. I think I will be through well before lunch at this rate, Mr. Chairman. [Laughter]

Let's look at page 16, the PCBs. And the second to last paragraph at the very bottom says that:

> PCBs appear to be poor cancer causing or initiating agents that may promote or inhibit cancer depending on the temporal relationship of administration. This appears to be limited to the highly chlorinated PCBs.

And then there is a reference to epidemiological studies looking at human cancers and the deficiencies in those studies.

Do you have any evidence on studies which show a direct causal link between the application or administration of PCBs and cancer, or are we talking again about an association in these studies?

A. I will try to field this question. I don't profess to be an expert on PCBs. I have had some limited experience reviewing the literature some years back.

In answer to your question, I presume that you do not mean Ontario Hydro's own studies but

other studies in general?

Q. Well, firstly, Ontario Hydro's studies, if any, and then your knowledge of studies in general.

A. Okay. I am not aware of Ontario Hydro's studies specifically.

My knowledge of general studies: The data from the experimental data does not establish a causal relationship. The cancers that were found in some rat studies were at very high exposures and at those, a response relationship was not shown.

As I gave in my evidence in-chief regarding EMF, normally you would want to see that type of a relationship. In two separate species when the experiments were performed on mice, the response was not the same as in rats; in other words, there was not an increase in cancers.

Also, in the rat study, there was an overall decrease in cancers except for some very specific target sites. I believe it was a dose of 500 milligrams which were the sub-lethal doses. So really, a causal relationship has not been established.

Q. In Hydro's proposed Demand/Supply Plan - I am speaking of the plan which is up for approval - is there any possibility that PCBs will be

used or come into contact with staff or the general public? What is the possibility of the use of PCBs in their proposal?

A. I have to qualify it as a speculation on my part. As I indicated, I am not involved in the PCB area, but my understanding is that Ontario Hydro is phasing out the use of PCBs altogether wherever possible. Whether that means 100 per cent phasing out or not, I cannot confirm that.

Q. Very well. I would like to skip over pages 19 to 29 on magnetic fields for a moment and I will come back to that, Mr. Chairman. I am now looking at page 29, the conventional hazards.

I put some questions to Panel 6 on occupational health and safety and I am not inclined to repeat questions of that type here, but I would like to put a general question.

Does Ontario Hydro have any cost figure - whether this be a per kilometre basis or on whatever basis is appropriate - to show the health costs associated with the operation and maintenance construction and decommissioning of transmission lines? And I am not speaking now of herbicides or PCBs or anything else, just straight occupational health, worker accidents, death and so on.

MR. BANCROFT-WILSON: A. I am afraid I am not aware of those numbers. They may exist, but I am not aware of them.

Q. Very well. I would now like to turn back to page 19. We will discuss magnetic fields if I may.

And my first question is to Dr. Vascotto. I would ask you to comment on your qualifications to deal with this area in this way.

My understanding is that a knowledge of effects of magnetic fields requires expertise in several disciplines: Electrical engineering would be one; biology; probably theoretical biophysics because we are talking about the interaction of magnetic fields with matter and the nature of matter and atomic and molecular structuring and so on; epidemiology.

What areas are you specifically an expert in and what areas do you rely on the expertise of others in?

DR. VASCOTTO: A. Okay. I am a biologist. First of all, I am an experimental biologist. I do experiments on all organisms. My ancillary topic as a PhD. was in statistics and in the process, I was exposed to considerable academic exposure on the setting up of experiments and sampling

populations. And that does not qualify me as an epidemiologist, but it does allow me to evaluate the validity of some epidemiological studies.

The other areas, the biophysics, for example, I have two biophysicists on staff that I rely on with a PhD. in biophysics. We have an epidemiologist on staff at Ontario Hydro. Through our BEEF committee, we bring in all of the disciplines that are required and we have a fair number of electrical engineers.

Q. Sure. In the course of your examination in-chief, you gave as your opinion in many cases that there were no scientific or no significant effects and so on. I am deliberately not referring to a specific portion of the transcript at this stage.

To what extent are these observations you, yourself, have made, conclusions you, yourself, have drawn by your own studies? To what extent have you, yourself, reviewed the literature? And to what extent are you repeating the reviews of literature which have been conducted by others?

A. I would say that all three of them come into being. When I refer to effects or significant effects, I basically apply the rule that if the data is not statistically significant - that is, a

probability of .05 - between a controlled set of data and an exposed set of data, that, therefore, no effect has been established.

The other criteria that I use is, if the studies have been replicated and the results are contradictory, then no effect has been established.

On the other EMF effects' area covering all the disciplines, in the area of the mechanisms, for example, the biochemistry and the biophysics, I would rely on the opinion of biophysicists. But to a certain extent, on the overall issue I would rely to some extent on the reviews that have been carried out.

Q. When a statement is made, and I will refer you, for example, to page 27 of Exhibit 432, under the heading "Ontario Hydro's position", the second paragraph, the last sentence in that paragraph -- or, I am sorry, I should read the whole of that second paragraph.

> Many studies on electric and magnetic fields have been completed worldwide during the past two decades. Some studies have shown biological responses. Some have indicated a possible association between electric and magnetic fields and human health effects while

others have not. Based on the substantial evidence now available, the scientific community consensus is that a health risk from exposure to any of these fields has not been established.

Is that a conclusion, if I may call it that? Is that your personal opinion or is that an opinion which you have verified --

A. No. That conclusion would be the results of published reviews. And for most cases, yes, it would have to be the published reviews or outcomes of workshop of experts in the field or the reviews of health bodies which have come to those conclusions.

Q. Well, let me just be a bit more precise. This is a report on the consensus of the scientific community. Now, someone somewhere in Hydro must have examined the literature, discussed it with various people and said, I am now going to report in the form of this exhibit that a consensus exists.

[11:45 a.m.]

So my first question is: Who came to that conclusion; and, secondly, do you agree that that is in fact the truth, or that is in fact scientifically shown that that a health risk from exposure to any of these fields has not been established?

A. To the answer your first question, the section entitled "Ontario Hydro's Position" is an extract of the Corporate position on the subject. It was arrived at through the BEEF Committee, the Bioelectromagnetic Field Committee which I referred to my evidence in chief, where the various expertise went out and canvassed the expertise available in the corporation and the statements were then tested where they may be, where some doubt was against experts outside of the Corporation who are working on this subject, and basically that represented the common view of the BEEF Committee.

Q. Does that statement, that a health risk from exposure from any of these field has not been established, is that a statement about the causal link between these fields and cancer, or is this a statement about the association between magnetic fields and cancer or other human health effects, or does it encompass both?

A. It deals with a causal link. The causal link and the associated with measurements of magnetic fields. In fact, what we are talking about here are the magnetic fields, not surrogates of magnetic fields, not possible field exposure, but has a link been established with actual magnetic fields.

Q. Again speak causal link or association?

A. I would say both.

Q. In the literature there is reference to - I think the words used are - modest association between magnetic fields and incidence of cancer; is that correct? I believe that word is used in the SAVITZ study; is that correct? Is there a different between a modest association and a significant association?

A. I will agree with you and I will qualify my answer.

There are, as you say, modest associations but they do not fall under my previous indication, I said an effect is not shown unless it is statistically significant with measured fields, and I don't believe it's really been shown.

Q. Is that your assessment made on your own research or is that an assessment as you would see it in studying the literature?

A. Epidemiological studies, I have not conducted epidemiological studies so it would have to based on a review of those studies.

Q. But would you say that there is some division of opinion, some debate about the answer you

have just given in the scientific community?

A. The division of opinion is more related on how good the surrogates are as indicators of magnetic fields. I think that there is very little dispute in the published literature on whether a causal relationship or an association with measured field strengths has actually been established.

Q. Let's go back to page 19 of Exhibit 432. I would like to go through this in a little bit of detail, if I may.

The heading, "Electric and Magnetic Fields", EMF, the second paragraph says:

> Electric and magnetic fields exist wherever there is electricity natural or man made. The earth itself has a magnetic field. Processes in the earth's core create a direct current magnetic field which makes navigation with a compass possible.

And then the next sentence is:

> "Similarly, all modern electrical devices also depend on electric and magnetic fields to operate.

Now, direct current has been present, I would guess, since time began and is part of our

biology. But alternating current, which I take is the current that operates modern electrical devices, has only been present for the last 150 years or so, you correct me if you wish. Can these two types of currents be held, as it appears to me is implied in this paragraph, identical for the purposes of health effects?

A. They are not identical.

But also alternating currents have been around longer than -- there are some natural sources of alternating currents as well. My understanding at least is that there are some pulses present even in our earth's magnetic field. Lightening can cause some 60 Hertz fields for short periods of time, but that's beside the point.

I don't believe that that paragraph was intended to minimize the fact that a significant different type of environment has been created by the use of electricity.

Q. Well, can you tell us what you know of the relationship between a magnetic field from an outside source and living tissue? Can you tell us how that operates, if necessary at the cellular level how the magnetic field has an effect on the living tissue?

A. In this context are we talking about

a DC field or an AC field?

Q. Let's start with the DC field and then let's compare it to the AC field.

A. There is a great deal of evidence that biological systems rely quite heavily on the DC fields for a large number of activities. The main ones that come to mind would be the circadian rhythms which have been demonstrated in some organism to rely. Animals depend on them for orientation.

The main sources of this seems to be related to magnetosphenes or particles which are charged or which can align themselves relative to this field, and depending on the organism they can be either diffused on the surface of the cell membrane, there can be interstitial spaces between cells, or in some cases they are actually concentrated in organs. Eyes in some of the higher organisms are areas that typically contain these.

Q. With respect to alternating current, what happens when an alternating current creates a magnetic field and that is placed in close proximity to living tissue? Can you tell me what happens at the cellular level?

A. A current is induced within that. That's one of the things that we to know, is that an

electric current is induced within the tissues. This electric current is apparently a very minuscule current relative to the thermal properties or thermal regimes created by metabolic process. How that would interact with the body is not really known. That is not the only way.

Q. No. In addition to the production of heat, which is minimal compared to the body, there are other fields, other forces, are there not?

A. Yes. Once you get beyond that we are in the realm of hypothesis of how some things might or might not happen. We know -- well, we don't know, but there is evidence that exposure to certain fields can alter the behaviour of glands such as the pineal gland which is one of these that concentrate on particles that controls circadian rhythms.

There are also some theories that the calcium ion channels between the surface of the cell membrane and the interior of the cell membrane may be affected because of the steep gradient. Apparently it's reported - and it is not my area of expertise - but it's reported there are several calcium receptor sites on the surface of cells, but the limit, the number of calcium sites, although there are many, they are relatively limited, and if one can alter the state

of these sites in a minor way there could be a magnification of this in the interior of the cell.

The research so far are hypothesis of mechanism, the other one is the cyclotron resonance hypothesis.

Again, these are hypotheses but they have not really been verified.

Q. Could the presence of a magnetic field which arises result of an alternating current, cause the changes to be made in the cell in a resonating way, back and forth, back and forth? Is that part of the hypothesis?

A. It is one of the main hypotheses that have been posed. The experimental data to date does not appear to be consistent enough to say that it works that way.

Q. Would you say in the most lay terms, does this cause additional stress on the cell to be in the presence of a magnetic field?

A. I could not say that, no.

One of the most prominent ones, for example, is the calcium reflex and responses have been obtained at .6 of a nanotesla and they disappear at a higher level. So I really wouldn't be able to speculate.

Q. There is a great deal of uncertainty in all of this?

A. At the mechanism level there is a great deal, yes.

Q. I take it magnetic fields are not easily shielded?

A. That's correct.

Q. You can't protect yourself as one can with an electric field?

A. That's correct.

Q. Do you have any information on the strength of the fields which are present in living tissue compared to the quantities or the strength of the field listed in figure 2 of Exhibit 432?

A. Almost all the work that I have seen -- first of all, let me answer it outright. No, I do not have that information.

Most of the work that has been done in tissues converts the magnetic fields to electric currents and then the data is worked in terms of microvolts or millivolts per centimetre. So we are looking at different units.

In a variety of publications, and there are literally thousands, there are some conversion factors, for example, if you put 10 kV per metre field

on it, the fields inside of a cell may be, say, .2 millivolts per centimetre, or whatever. That sort of evidence is scattered throughout the literature, and so of may refer to those.

Generally, the data that I have seen suggests that in order to have measurable amounts of change inside of the cell, the caveat is that it tends to refer to thermal properties. You will have to be working in the 20 to 50 millitesla range.

Q. So can you translate for me so I can understand this a bit more, I take it then that the strength of a field that one would experience with respect to, say, a hair dryer within an inch or so of one's hand or head, what would the strength of the field there be in relation to the field in the cell in terms of proportion? Much greater, I am assuming much greater.

A. Do you mean the electric field, the electric current created inside of a cell relative to the natural background? It would be minuscule, that's my understanding.

Q. Compared to the external?

A. Yes.

Q. The force of the external field?

A. Yes. If you were to put a hair dryer

next to the cell, relative to the natural currents between cells, that field would be minuscule, that is my understanding.

Q. I see. Let's stay with figure 2 for a moment or so. What is the purpose of this figure? What were you trying to show in this figure?

A. What I was trying to illustrate was that given the uncertainty of whether short-term exposure or long-term exposure may be the critical insult, if such an insult exists, under normal every day lifestyles one may be exposed to a large range of magnetic field strengths depending on activity, and that many of these will expose certain portions of the body, such as extremities, to fields much, much larger that would be encountered from the fields of power lines for someone living off the edge of the right-of-way. It was an illustrative sort of thing.

Q. With respect to the 230 kilovolt transmission line, I take it that for the purposes of Demand/Supply Plan we will be speaking of a 500 kilovolt transmission line, do you have figures which would be comparable or which would apply to the 500 kilovolt?

A. In the evidence in chief there was an exhibit shown in terms of a profile, calculated

profiles for a 500 kV single circuit line. And I believe that the fields at the edge of the right-of-way -- I mean, in the centre of the right-of-way would be around three to five microtesla, and around the centre it would be around 15 to 16. I have it here.

[12:03 p.m.]

Okay. Directly below the conductors, one metre above the ground it is in the order of 10 to 11 microtesla.

Q. Right.

A. And at the edge of the right-of-way --

Q. Now, when you say "edge" do you mean 50 metres or 18 metres?

A. In a 500 kV line it would be between 30 and 40 metres off of the centre line. There would be around three to four microtesla.

Q. Three to four?

A. Yes.

Q. The first three items on the figure, the electric range, the hair dryer, the television, are quite different in quality, are they not, with the second three items, the transmission line, voltage lines, and the pad transformer in that the electric

range, hair dryer, television in a home can be turned off or on; when you start up an electric range or hair dryer or television there is a surge of power, is there not, a flash field?

A. Yes, there is.

Q. Whereas with the transmission line, low voltage, distribution lines, and transformers, these are on continuously; is that correct?

A. Yes, basically.

Q. So is that not a qualitative difference in the nature of the field which a person is affected by or may be affected by?

A. Oh, you are definitely correct, and as a matter of fact, current researchers are wondering whether this up and down is the critical thing rather than the constant. There is a great deal of debate among epidemiologists as to which metric is the important one in this case.

Q. In addition, a consumer, someone who is living in a home near a transmission line, for example, will always be in the presence of some fields, magnetic fields which emanate from the transmission line, but they could take steps, such as turning off their electric range or not using a hair dryer or sitting well back from a television set and thereby

reduce the strength of the field; is that correct?

A. Yes. Well, there are three elements that would determine the exposure in the home.

One would be the external background, which would most likely be affected by the three on the right-hand side. Then there are the fields created by the grounding currents, which are apparently quite significant, and the third is the use of appliances. And people would be supposed to a composite of the three, if you will.

The first two they would have very little control over unless they rewired their home, for example. In the third one they definitely have a choice. And some people have suggested that is the information that needs to be provided to the public.

Q. So people are advised they may, if they wish, reduce the effect of magnetic fields by not using certain appliances and so on?

A. Reduce their exposure, not effect, because that really is not --

Q. Would it be your recommendation that the public be so informed?

A. My personal?

Q. Yes, your personal view, or are you speaking for Hydro when you express your view on this

point?

A. I believe that the public when answering these types of questions should be given a perspective as to where the fields reside, what the nature of the fields is, and what they can do. When I do get inquiries directed at me I provide them with this type of information.

Q. There is not an active campaign though to inform people, I take it. It's if they choose to inquire; is that correct?

A. The packages that go out routinely to people who have inquiries have tables which show the ranges of fields associated with things like power lines, appliances, tools, electric tools, and so forth. That information is present in the packages that we send out to the public.

Q. But again, they must request this, I take it; is that correct?

A. If we have an inquiry, yes, if someone calls in. We have large numbers of inquiries, I am informed.

Q. You focused to some extent on cancer, but I gather there are other potential health risks which are under study, including potential hormonal changes. You referred to the...'circardian' system?

A. Circadian.

Q. Circadian system, I'm sorry.

A. Circadian system, yes.

Q. The changes in the pineal gland I think is referred to in --

A. The pineal glands, yes.

Q. Is there also evidence of mood swings or depression and so on?

A. The pineal gland has been linked to moods swings, as you say, stress and so forth.

The link that has been made to ELF has been because some animal studies, primarily with rats, have shown a depression of nighttime melatonin, which is a substance that's regulated.

I am not aware of clinical studies that have tested the relationship between fields and depression. I am aware of studies that have looked at melatonin and depression in a closed circle, if you may, and tried to relate melatonin to mood swings -- electric fields to mood swings.

The unfortunate thing is that the melatonin suppression, there is a fair bit of data on rats, the data on mice is inconclusive. There is quite a bit of data on melatonin levels in humans, the diurnal aspect. The data related to melatonin

suppression by magnetic fields is virtually non-existent. And there is one study and it has been inconsistent. The author claims that he has seen this sort of thing; others claim that he has not.

We are ourselves involved in studies on melatonin incidentally at the Clark Institute right this minute to clarify this.

If I may go further, the melatonin issue is not so much a stress issue. It is related more to cancer once again.

Q. I believe in your direct examination you made a statement, and I can put you to the correct page if you wish, along the lines of generally speaking the higher the dose the greater the response. I think you made a statement along those lines.

Does that hold true in relation to the strength or frequency of magnetic fields?

A. No, the response was relative, magnetic fields do not show this.

Typically, in chemical toxicity we accept that the greater the dose, the greater the response. And this doesn't seem to be consistent through the case with magnetic or electric fields. In fact, I believe it's OTA report or in some of the reports they clearly say that more is not necessarily better -- or more is

not necessarily worse.

Q. Did you say OTA report?

A. I believe it's the OTA report or it is the -- it is either the OTA report or the -- this pamphlet that goes out to our...

Q. I will refer to the OTA report a little later on, if I may.

At page 24 in Exhibit 432 there is reference to a couple of studies. One is the Wertheimer study and the second is the SAVITZ study, and I gather that there are methodological concerns about this many sources of error which makes a hard conclusion impossible to reach. Is that a fair gloss of the meanings of these reports?

A. It is a fair gloss, but let me preface that. Epidemiological studies by their very nature are very difficult to interpret unless you have very large risk factors.

So it is not a criticism of the investigators so much that it is a very difficult to field to do good, significant studies in.

Q. Let's just look at the two other reports. I don't intend to put these in as exhibits. I would hate to have to photocopy this 20 times.

But I have discussed the two or three

sentences I want to go over with Dr. Vascotto during the break, so I think he's prepared for this. I believe he has a copy of the report.

I am citing the United States Environmental Protection Agency workshop review draft, dated June, 1990, entitled "Evaluation of the Potential Carcinogenicity of Electromagnetic Fields". It is labelled very prominently "Do not cite or quote", but I am going to take my career in my hands and hope that if I read their disclaimer it will assist.

They say:

> This document is a preliminary draft. It has not been formally released by EPA and should not at this stage be construed to represent Agency policy. It is being circulated for comment on its technical accuracy and policy implications.

I spoke earlier, as I mentioned, with Dr. Vascotto, and he mentioned that he believes the report will be extensively rewritten. I am not quite sure where and how. But I wanted to read a paragraph to him and ask for his further comments.

I am citing page 1-6 from the introduction at the very, very bottom:

> In conclusion, the several studies

showing leukaemia, lymphoma and cancer of the nervous system in children exposed to magnetic fields from residential 60 Hertz electrical power distribution systems, supported by similar --

A. Excuse me. I must have the wrong report or wrong page. Is it 1.6?

Q. I'm sorry, it should be -- perhaps, if I may, I will just show you.

Pardon me, Mr. Chairman.

THE CHAIRMAN: It's all right.

MR. M. CAMPBELL: I believe the wording is the same in both reports. I am reading from page 1.6, the Executive Summary of the June, 1990 draft.

In conclusion, the several studies showing leukaemia, lymphoma and cancer of the nervous system in children exposed to magnetic fields from residential 60 Hertz electrical power distribution systems, supported by similar findings in adults and several occupational studies also involving electrical power frequency exposures show a consistent pattern of response which suggests but does not prove a causal link.

Frequency components higher than 60 Hertz cannot be ruled out as contributing factors. Evidence from a large number of biological test systems shows that these fields induce biological effects that are consistent with several possible mechanisms of carcinogenesis.

However, none of these processes have been experimentally linked to the induction of tumors either in animals or in humans by EM field exposure. Particular aspects of exposure to the EM fields that cause these events are not known.

The next paragraph continues with references to further studies, and one of the sentences towards the bottom of that paragraph reads:

With our current understanding we can identify 60 Hertz magnetic fields from power lines and perhaps other sources in the home as a possible but not proven cause of cancer in people.

They then go on to recommend the need to continue to evaluate information from studies, and so on.

Now, in the face of a statement like that, and I gather that is maintained in your version of this report--

DR. VASCOTTO: A. Basically, yes.

Q. --are you still of a view that there is no significant, in your term, either link or association?

A. Yes. Yes, there is, and I will explain why.

First of all, what EPA calls a "possible link" it does not mean "possible" in the sense that you and I use it, but they have discreet criteria that must be met by the studies before a substance or an insult can be called a possible carcinogen. My understanding is that this does not meet it.

As a matter of fact, I have here some comments that were made regarding the Executive Summary, which is what you are quoting, and these come from the Selected Comments from the White House Committee on Interagency Radiation Research and Policy Coordination Review on the EPA Review Draft Evaluation of the Potential Carcinogenicity of Electromagnetic Fields.

Then it states:

First of all, overall we conclude

that the evidence presented in the EPA report does not provide a scientifically sound basis for linking cancer to exposure to electric and magnetic fields. We recommend that the review draft be substantially revised...

and so on.

In regard to the Executive Summary:

The Executive Summary presents a stronger association between exposure to electric and magnetic fields and induction of cancer. It appears to be supported by the summaries and discussions of the relevant scientific literature.

Essentially, the same kind of comments also came from the National Institute of Health, the National Cancer Institute in the States. Again, most importantly, and I am quoting:

The Executive Summary remains scientifically unbalanced and we believe it should be substantially rewritten.

Q. Fair enough.

A. So basically, you know, it's more than my opinion in this. It is an opinion of experts

in etiology.

Q. Are they speaking of a causal link or are they speaking of associations when they make those statements?

A. In one particular one, basically they were talking about the association with induction; in other words, the actual causative, being able to cause cancer.

Q. In the battle of experts and reports can I now look at the OTA paper you referred to earlier? And this, I believe, was filed as a response to Interrogatory 2.29.12.

Again, I don't want to do anything other than read one or two paragraphs from this, if I may. This is from the Introduction and Overview, page 3 of the report.

You are familiar with this, I believe Doctor?

A. Yes, I am.

Q. I am going to read from the last couple of sentences of the third paragraph from the bottom, starting with the words:

> Epidemiological evidence, while controversial and subject to a variety of criticisms, is beginning to provide a

basis for concern about risks from chronic exposure. Some observers find this epidemiological evidence more persuasive in light of the clear evidence of effects that is available at the cellular level but others insist on treating the evidence from these two areas as separate.

Next paragraph:

As recently as a few years ago scientists were making categorical statements that on the basis of all available evidence there are no health risks from human exposure to power frequency fields. In our view, the emerging evidence no longer allows one to categorically assert that there are no risks, but it does not provide a basis for asserting that there is a significant risk.

And then they go on to say, and I think this is fair to read in as well, that:

If exposure to fields does turn out to pose a health risk it is unlikely that high voltage transmission lines will be

the only sources of concern. Power frequency fields are also produced by distribution lines, wall wiring, appliances and lighting fixtures. These non-transmission sources are much more common than transmission lines and could play a far greater role than transmission lines in any public health problem.

Would you comment, please, on that extract which I have just read, Doctor?

A. Yes. I believe that the OTA portion that you have read is a fair overview that was written I believe in '88 and published in '89. I understand that this is being reviewed and there will be a new document coming out in either '92 or '93.

I also submit that there has been some evidence that has come out since then that has led many of the researchers, not all of the researchers in the field, to suggest that short-term exposure may be more significant than chronic exposure as would be represented by the transmission lines.

And the more recent epidemiological studies have also suggested that such things as black-and-white, colour TVs and I believe hair dryers may be -- difference associations, and there has been a

greater interest over the last year or two of looking at exposure due to appliances, and so forth.

[12:22 p.m.]

But the question is still up in the air. Certainly power lines are not being ignored as a possible source.

Q. I would like to turn to page 75 of the OTA document, please, where they --

THE CHAIRMAN: I am not sure I know what OTA stands for.

MR. M. CAMPBELL: I am sorry - Office of Technology Assessment. It is an office which appears to emanate from the Congress of the United States.

The document - I should have perhaps identified it more fully - it is entitled, "biological effects of power frequency, electric and magnetic fields". It is a background paper performed as part of OTA's assessment of a document, a study, I gather, entitled, "electric power, wheeling and dealing, technological considerations for increasing competition".

DR. VASCOTTO: It was an attachment to Interrogatory 2.29.12.

MR. M. CAMPBELL: Q. And I believe it was a document prepared by members of the department of

engineering and public policy, Carnegie Mellon University, Pittsburgh; is that correct, Dr. Vascotto?

DR. VASCOTTO: A. Yes.

THE CHAIRMAN: Perhaps we should put 2.29.12 on the record.

THE REGISTRAR: That already has been entered.

THE CHAIRMAN: It has already been entered?

MR. M. CAMPBELL: I was reluctant to make enormous numbers of copies.

THE REGISTRAR: 2.29.12 is 434.1.

THE CHAIRMAN: Thank you.

MR. M. CAMPBELL: Q. I would like to get comments from Dr. Vascotto on the page or two dealing with policy implications in the face of this uncertainty. And I am reading from page 75, the top paragraph, where the author states:

> There is, of course, nothing knew about a possible environmental health risk for which our scientific understanding is incomplete. Legislators and regulators have been dealing with such risks for decades. But when we look with care at the scientific understanding

that is available for 60 hertz and other low frequency electro-magnetic field exposure, we discover that this particular problem may be very different from previous problems in environmental risk in several ways.

And I will try to read very briefly the three or four major differences: First, the quality of the science that is now available is remarkably high and there is a further discussion of that; second, because the complexity of the science, the strategies which legislators and regulators have evolved to deal with other certain health risks may not lead to effective results for this possible risk; and then third, public discussion of 60 hertz fields has been almost exclusively limited to the context of high voltage transmission lines.

I wonder if I could ask Dr. Vascotto to comment on, firstly, his view of the possible or the prudent course of action given the uncertainty of our understanding in this area and his views on the three ways in which this problem is different from our earlier experience in environmental risk.

DR. VASCOTTO: A. I understand the second one. I am not sure I understand the first

question.

Q. What is your view of the appropriateness of the response in the face of a possible environmental health risk for which scientific understanding is incomplete?

A. Well, I tend to agree that the policy-makers are constantly faced with this type of a problem. And my understanding of it is that normally they weigh the magnitude of the risk and consequences in a situation of no action in a variety of different types of actions to be taken.

So in that respect, I don't think that there is anything novel about this specific issue.

Q. Very well. At page 76 the OTA sets out policy alternatives and they list a number of them: No. 1, at the very bottom, is, do nothing until the science becomes better; 2, make public information available but take no additional actions; 3, adopt a field strength safety standard approach to transmission line fields based on the fiction that the numbers are supported by a review of the science. Ignore fields from all other sources; 4, adopt a similarity-based approach to transmission line fields which makes the exposure that people receive to these fields similar to those they receive from other sources in modern life.

Ignore fields from other sources; and then 5 - and I would like to ask you about 5 - adopt a prudent avoidance strategy - that is, look systematically for strategies which can keep people out of 60 hertz fields arising from all sources but only adopt those which look to be "prudent" investments given their costs in our current level of scientific understanding about possible risks.

They then go on in the next two pages to discuss these options. And then on page 79 in relation to the prudent avoidance strategy, they make this statement:

> We conclude that it might be possible to justify investment rates of up to some thousands of dollars of person exposure avoided but not possible to justify rates of investments in field avoidance activities that are significantly higher than this.

Then they then go on to say:

> Thus, for example, while it might make sense to work to avoid exposing people in siting new lines, in most cases with our current knowledge, it would not make sense to tear out and rebuild old lines.

They also speak about redesigning new appliances but not necessarily throwing out existing ones.

I wonder if I could have your views on that statement by the OTA?

A. The whole thing?

Q. With particular reference to those points.

A. To the last lines you mean?

Q. Which I just read to you.

A. Yes.

Q. But if you have other aspects of this you want to raise, I have no difficulty.

A. Okay. To me, prudent avoidance basically means, and as I have stated in earlier cross, has to be weighed against all other impacts that one might create by taking an action. It involves costs, it involves environmental impacts and a weighing on the benefits.

In this particular situation, in order to avoid a possible or non-existent risk, one may create other known impacts. That is No. 1.

Second, there is also the question in prudent avoidance, and it is defined by these people, that one should not undertake unnecessary costs or --

the very nature of this thing is that you would make common sense decisions.

And I would suggest that taking out old lines and building new ones might may become very much contrary to what is defined as prudent avoidance because a substantial cost and disruption of people in communities may be involved.

Q. I believe they said that that would not be necessary. They were speaking of siting new lines away from people but probably not justifying the removal of existing lines.

A. Yes.

Q. I believe that was the thrust of it.

A. But even, you know --

Q. My narrow question is: What is wrong with siting lines away from people in the face of this uncertainty?

A. If we were to take magnetic fields alone out of context of anything else, it may make sense; but if you take the power line and all of the associated impacts, it may not, you know.

Okay, taking a power line away from people and putting it in very productive agricultural areas, you know, you may find that, indeed, the farmers in that area do not think that that is a very prudent

move. Or, let's say, moving a power line through a national park or provincial park may not be .... There are too many factors that have to come into the decision-making. I think I better stop here.

Q. One or two final questions. I want to put a question on the research which Hydro is contemplating. But before we get to that, in the plan we are not dealing with site-specific locations for these power lines, but do you have any estimate about the length of line which will go through urban or rural or non-populated areas? Do you have any estimates of that?

A. I don't but perhaps Mr. Bancroft-Wilson has.

MR. BANCROFT-WILSON: A. How would you define "non-populated areas" and "away from people"? Like, define non-populated first.

Q. Let's say for forest areas where the density is less than one person per square mile as opposed to urban areas which could be Toronto, as I understand it.

A. We don't have any estimates of that, but obviously populated areas include a large part of the province and obviously some areas that you might consider remote. Native communities are smaller

resource use communities. We would consider that, you know, populated. People do live in those areas. If you take a square kilometre by square kilometre basis, you could find areas where nobody resides at present.

Q. Do you have any estimate of the numbers of people who may be dwelling along these corridors, any population studies?

A. We don't have any specific corridors as part of this, the DSP study.

Q. In existing corridors, do you have any estimate of that? Is that considered?

A. I mean, how many people dwell along existing Hydro rights-of-way?

Q. Yes. Do you have a range, within a kilometre, within 500 metres? Do you have any?

A. Well, no, but I can tell you that we have thousands of miles of transmission lines and many of those are through urban areas. I mean, many, I mean a significant proportion.

Q. But you haven't done censuses and you haven't --

A. No, certainly not, no.

Q. And you have no idea about schools that might be located within this band or hospitals or health care institutions?

A. No. There are a range of facilities. Obviously, you know, I have to go back to power lines. To get back to Mrs. Mackesy's point, power lines are needed in areas of high demand, which are urban areas, and they have to reach transformer stations and distribution stations in those urban areas. So by definition, you have power lines that go through urban areas to bring them power.

Q. Do you have any idea of the estimate of the costs that would be incurred if the width of the right-of-way was doubled in, let's say, urban areas? Do you have any estimates of that?

A. You mean, existing lines, take an existing line now and--

Q. Let's say existing lines, yes.

A. --doubled the--

Q. The right-of-way.

A. --the right-of-way. So acquire any properties that were adjacent to it?

Q. Yes.

A. It would be in the millions and millions of dollars, but I couldn't tell you.

Q. And do you have any information on whether or not with the locating of new transmission lines any attempt will be made to broaden the breadth

of the proposed rights-of-way to perhaps twice what they are now?

A. No. As we indicated earlier in our evidence, that at the present time such measures as that are not being contemplated by Ontario Hydro.

Q. Okay. The last question has to do with the several studies which are contemplated by Ontario Hydro to follow up on this issue. And in particular, I am referring to Exhibit 434.20. And again, I believe Dr. Vascotto has this. I don't know that it is necessary for me to do anything other than list the subjects of the studies and the duration of the study.

THE REGISTRAR: 434.20?

MR. M. CAMPBELL: That is correct.

THE REGISTRAR: Is 7.10.206?

MR. M. CAMPBELL: That is correct, yes.

Q. I wish to refer to page 3 of the response where the several research programs under EMFRAP are listed: Occupational epidemiology study, childhood epidemiology study and several others.

I note that all of these will be completed in 1993, 1994; is that correct?

DR. VASCOTTO: A. That is the target.

Q. And can you tell me the ways in which

these studies differ from the Wertheimer, the Savitz, the other studies which you have distinguished on the basis of methodology or causes of error? What makes these studies qualitatively better and likely to give better results than those earlier studies?

A. Let's just say that they are improvements. The occupational epidemiological study, for example, to my knowledge will be the first study in which for each job category a subset of current population in that job will be carrying or have carried already dosimeters for up to a week to obtain a profile of what they are exposed to, in some cases even outside of the job, which can then be related to the cases which, in some cases, are diseased.

So, the No. 1, the main criteria is that we, in fact, will have some really robust data as to what those people may have been exposed to, recognizing that through time, the nature of the job has changed and there will have to be some adjustments for that.

[12:35 p.m.]

Q. In certain cancers, though, the cancer may take up to 10 years to develop, so what provision is made for monitoring the health of those persons who have --

A. This a retrospective study so it is

looking at people that have already entered the cancer registry, if you will.

What we are doing is we are monitoring people in those same types of jobs in the industry to see what they are exposed to now and then we -- not we, the epidemiologist will be allocating those measurements to those people that were in those jobs but which have contracted cancer or have not contracted cancer.

Now, to help with this, once the dosimetry is done, individuals are brought in who have experience in the past to say, what are these jobs truly representative of? What they are doing now? Is it truly representative of what they did in the past?

So, it's a matter of quality. For once we will have some measurements. How good those measurements are in representing the past is a question that we will try to answer as best as we can.

Q. What plans has Hydro made, what might be called a contingency study, should the results of these tests in '94/95 show that there are indeed significant links or significant associations between EMFs and cancer and other forms of diseases?

A. I can only speculate on that.

Informally we do not have in place a

contingency plan.

The intent is, as the studies evolve and results come in -- let me backtrack a bit.

The first thing we want to do is to get a good feel for risk estimation, and to that extent a study has just been added about year ago, which is next to last in the column, where the University of Waterloo will be evaluating the results of all of these studies and other studies to determine if in fact a risk has been established, a causal link has been established, and the magnitude of the risk. And on the basis of that, then the organization will get together and say, okay, what do we do about it. Something has to be done, if the studies are positive you have to do something.

We will rely very heavily, I expect, on that risk estimation. But at this stage it would be premature to develop a plan on the assumption the studies are either positive or negative.

Q. But it could have an enormous effect on, shall we say, the location of a right-of-way or the breadth of the right-of-way or other shields or other forms, could it not?

A. Well, the occupational epidemiology study is not likely to, because really we are looking

at the way people work within the industry and those would have to result in changes in work practice.

Q. But you are also looking at childhood epidemiology studies, animal carcinogenesis, high level --

A. That's correct.

Q. So there could be other effects, could there?

A. Yes, that's where I was going to next. Basically if the childhood epidemiology study were to prove positive, then basically we would have to rethink our current Corporate position.

MR. M. CAMPBELL: Well, I think those are all me questions, Mr. Chairman. I have indeed finished before lunch.

Thank you, Dr. Vascotto.

DR. VASCOTTO: Thank you.

MS. PATTERSON: Dr. Vascotto, I just have a question about microwave ovens. Did you come up with a figure for figure 2 on page 21 of Exhibit 432 comparable to these examples? You have got electric ranges and hair dryers.

DR. VASCOTTO: I am not sure. I think I recall seeing in the last couple of days a figure that might have been microwave ovens.

Now, in microwave ovens, the figures that I have seen are associated with the motor at the back of the microwave. While I'm talking I am trying to think where I saw the figure.

There is a substantial magnetic field near the motor, near the casing of the motor behind the microwave oven, but that will not be from the waves inside of -- what is used for cooking your food basically.

It's a conventional rotary electrical motor. When you have that you do create a magnetic field. These fields tend to be substantial. Some of the highest levels, for example, are found in electric drills. But there are figures for that.

MS. PATTERSON: I was just wondering about it in the context of Hydro's promotion of microwave ovens for saving electricity and the fact that you would be using them a lot more than electric ovens in terms of off and on.

DR. VASCOTTO: Okay, I will speculate on this, if I may.

If all microwave ovens are like the one that I have in the home - I am really speculating - the motor is located in the back of the unit, so the field would basically -- you would be a good 18 inches away

from that. The field drops off very rapidly, as you see in figure 2, for most motors.

I would suggest that you probably would be looking at the type of configuration that you see in the figure -- it would probably be in the order of a hair dryer, something like that. The field strength may not be quite as high but it drops off that rapidly. So that when you are 18 inches away, it would be quite small.

In appliances that seems to be the situation. You have a very high field in close contact but it drops off very rapidly.

MS. PATTERSON: Thank you.

THE CHAIRMAN: Thank you, Mr. Campbell.

Before I call Mrs. Formusa, is there any else who wants to ask this panel any questions?

Mrs. Formusa?

MRS. FORMUSA: Thank you, Mr. Chairman.

RE-DIRECT EXAMINATION BY MRS. FORMUSA:

Q. I wonder if we could refer to two pieces of material, first of all, Volume 103 of the transcript, and Exhibit 434.3, which is SP686.

My first question is for Mr. Huggins, it's in Volume 103, page 18084, and at line 17, Mr. Huggins, I will just remind you, this is

cross-examination by Mr. Shepherd of IPPSO, he was asking you about Appendix C of Exhibit 434.3. He asked you what it was all about and whether you were familiar with it. And at line 20 he asked you the question:

"It is, correct me if I am wrong, it is an analysis of the net impact in Ontario with respect to jobs and GDP and a number of other factors; correct?

And you agreed with him that it was an analysis of the nets impacts and pointed us to Appendix C of Exhibit 434.3, and that's at page C-5, you referenced some caveats. I wonder if you could turn up page C-5.

You simply mention the caveats and then you and Mr. Shepherd embarked on another discussion.

I wonder if you could now, at page C-5, read those caveats out. There is two paragraphs on that page.

MR. HUGGINS: A. "The above analysis measures the gross impacts of Ontario Hydro activity and does not reflect the net impacts on the economy. Were the Ontario economy at full employment over this period, some of the jobs created by the construction of new facilities in

Ontario would be drawn from other construction projects or through migration. The net impact would therefore be some fraction of the above figures.

In other words, input-output analysis measures the gross impacts of Ontario Hydro activity without accounting for the efficiency of resource allocation. Unless the inputs used by Ontario Hydro are drawn completely from an unemployment pool of capital and labour, these resources will have an "opportunity cost" or a value in alternative use. Therefore, the net economic impacts from Ontario Hydro's expenditures would require valuing each input on an incremental basis to its opportunity cost. This is the realm of social cost/benefit analysis and has not been attempted here."

Q. In light of having read those caveats out now, I would like to ask you whether your answer to Mr. Shepherd's question about whether this was a gross impact analysis, whether your answer was correct?

A. The answer was not correct to that extent.

Q. Thank you.

Staying with you, Mr. Huggins, and staying with Volume 103, at page 18088, at line 18. Again, this was still --

THE CHAIRMAN: Just for the record, I think you used the word "gross" and did you not mean to use the word "net" when you asked Mr. Huggins the question, or am I misunderstanding this whole thing?

MRS. FORMUSA: I think Mr. Shepherd asked the question with respect to gross impacts.

THE CHAIRMAN: But you said, I thought you just said to Mr. Huggins, was your answer that this was a gross impact incorrect. I may have heard it incorrectly, but that's what I thought you said.

MRS. FORMUSA: I'm sorry, I had intended to ask whether his answer as given to Mr. Shepherd was correct. I didn't think I used words "gross" or "net".

THE CHAIRMAN: I perhaps didn't hear you correctly.

MRS. FORMUSA: I'm sorry.

MR. HUGGINS: Perhaps the simple answer is, the answer given to Mr. Shepherd, aside from the caveats, was not correct.

THE CHAIRMAN: That's right.

MRS. FORMUSA: I know embarking on gross and net is a concept that I should stay away from. I'm sorry if I confused you.

Q. At page 18088, at line 18, at this point in the discussion you and Mr. Shepherd were looking at the impact of the purchase on rates. You were asked to read -- again, we were in Appendix C of Exhibit 434.3, and Mr. Shepherd read to you at line 21 from page C-4, and I will just quote:

> The average electricity price is higher under the purchase plans than under the no-purchase plans.

And his question to you was:

> "I put it to you, Mr. Huggins, that you will see nothing in here that says, oh, but that's only temporary. It just says there is an increase in electricity prices, period. "

And you responded:

> "Well, I'll get back to you. This report concentrated on the period up to 2009, and I believe you will see benefits after that, but they are not manifested in this report."

Now, you have said that you would get back to us about the benefits after 2009 and I wonder if you could now elaborate on that point with respect to rates.

MR. HUGGINS: A. My understanding is that after 2009 the rates do get substantially better.

Q. Are you able to tell us why?

A. The rates for energy charged under the Manitoba Hydro contract have steps in them so they decline. They start off at 1.3 times the stated base energy charge, then decline to one and then decline to .75 times. And as it goes down, of course the relative cost of the purchase declines in real terms. So, that produces a benefit later the contract period.

Q. Thank you.

Could we now, still in Volume 103, turn to page 18219. At about line 22 Mr. Shepherd was asking you, Mr. Huggins, with respect to the intangible benefits associated with the purchase, and you were then speaking about the last benefit, which was:

> "Improved interprovincial trade and other benefits are also seen as a major benefit to the province and to the country."

Over on page 18220 you were asked how

that was the benefit, and you said at line 9:

"I guess it has been viewed in my dealings with both the province and the federal people in the business that they have strongly supported interprovincial electricity exchanges."

I wonder if you can tell us where the government has expressed its support for this interprovincial electricity exchange, or exchanges in general?

[12:50 p.m.]

A. I guess there have been a number of occasions.

The previous government I guess expressed support for this kind of activity verbally throughout the negotiations, and specifically, at the time the contract was signed Mr. Peterson took part in the signing of the contract. I am in possession of a letter that was personally addressed to me by Mr. Peterson which certainly is an expression of support.

On top of that, I guess as the governments changed a year or so ago the incoming government in the Throne Speech assessed a high priority in trying to get this particular transmission expedited through the approval process, and I believe

that can probably be found on the Hansard record of the provincial government.

Again, I guess on a federal basis we have received a lot of verbal support. I can't find -- I couldn't quote you written support, but there was tremendous interest in this undertaking from the Energy, Mines and Resources group in Ottawa during the negotiations.

MRS. FORMUSA: Mr. Chairman, the reference with respect to the new government's expression of interest is already an exhibit in the hearing in the Throne Speech. I wonder if we might file the letter then that Mr. Huggins has referred to with respect to the previous government, if he has it.

THE CHAIRMAN: Have you got it?

MR. HUGGINS: I may have it here. I have been moving stuff in and out of this binder.

MRS. FORMUSA: We can file it later and take an exhibit number. We needn't take the time.

THE CHAIRMAN: Okay.

MRS. FORMUSA: Could we just take an exhibit number, then? We will provide copies after.

THE REGISTRAR: The next exhibit number is 463.

MR. HUGGINS: I have it here.

MRS. FORMUSA: I will arrange for copies to be made.

---EXHIBIT NO. 463: Letter from Mr. David Peterson to Mr. Huggins.

MRS. FORMUSA: Q. My final two questions arise generally out of Mr. Shepherd's cross-examination. He spent a great deal of that cross-examination asking you to comment on Manitoba Hydro's view of the Manitoba Purchase, and to be fair, many of Manitoba Hydro's views were to the effect that they thought it was a good deal for Manitoba. I think that was clear in the cross-examination.

Now, to the best of your knowledge were there intervenors in the Manitoba hearings who disagreed with Manitoba Hydro's views of the contract?

MR. HUGGINS: A. There were a number of intervenors in the Manitoba Public Utility Board hearings which took place in the summer and fall of 1990 who claimed actually that Manitoba Hydro had made quite a bad deal. I understand there are still some that are making those kind of claims, but of course not at that hearing.

Q. Finally, my last question for you, Mr. Huggins, again arises out of that cross-examination of Mr. Shepherd, which as I said focused on Manitoba

Hydro's favourable view of the contract.

I would like to ask you as someone who is experienced in negotiations of purchase agreements could you tell us whether it's possible to negotiate a deal that's a good deal for both parties to a contract?

A. In my judgment I think it is. It is a matter of -- as you are negotiating a contract each side usually has different interests in the outcome of the contract, and you get the most successful contracts usually when the things that one side is interested in and the other doesn't mind giving up are obtained, and vice versa.

I guess my view of this particular contract was that -- certainly, I know the people I negotiated the contract with view this as a win-win on both sides. I think our feeling is that in the overall perspective it was good for both of us.

MRS. FORMUSA: Thank you, Mr. Chairman.

I would just like to thank the Panel and everyone who was involved with Panel 7, all the intervenors who have cooperated in getting their materials to us in advance of the Panels so that they could prepare for the cross-examination, for all the people who worked over the holidays, thank you, and I appreciate everyone's cooperation.

MR. BANCROFT-WILSON: Mrs. Formusa, I just have two matters that we would like to complete just before this Panel leaves, if I might.

The item today, if I may, Mr. Chairman, were the numbers for Mrs. Mackesy, if I could put those on the record.

She asked for a comparison of the unit cost for a 230 kV double circuit steel pole tower, and that number would be $900,000 per kilometre, and the comparative number for a 230 kV two circuit narrow base tower would be $690,000, and those would not include interest contingencies, overheads or property costs.

The other item from a previous request from Dr. Connell a couple of days ago, we have the transcript undertaking ready to file but if I could just leave you with the number.

Dr. Connell asked for the total right-of-way area required for the transmission facilities to meet the load supply purposes without the Manitoba Purchase, and the total right-of-way requirements based on the assumptions that you left with us would be for a total right-of-way area of 10,673 hectares for those facilities, as shown in figure 6 of Exhibit 33.

DR. CONNELL: I thought you were going to

do 'with' the purchase, too, Mr. Bancroft-Wilson.

MR. BANCROFT-WILSON: Yes, I'm sorry. We did say that. The number with the purchase that we have used, based on the same estimating levels, would be -- is the 9,000 hectares.

DR. CONNELL: Thank you very much.

THE CHAIRMAN: That is the end of the Panel 7.

We will adjourn then until Monday morning, the 27th, and we will be dealing then with Exhibit 452, if any party wishes to make any submissions on that document.

THE REGISTRAR: This hearing will adjourn until Monday morning next at ten o'clock.

---Whereupon the hearing was adjourned at 1:00 p.m. to be reconvened at ten o'clock on Monday, January 27th, 1992.

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E R R A T A
and
C H A N G E S

To: Volume 104

Date: Tuesday, January 21, 1992.

Page No.	Line No.	Discrepancy
17088	12	14 milligauss s/r 10 milligauss
17088	14	milligauss s/r gauss
17092	11	2.4 s/r to 4